Modeling U.S. Cancer Risk From Inorganic Arsenic

Why the S.W. Taiwan data are inadequate.

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S.W. Taiwan Data are Inadequate

We will show that:

- Cancer mortality in a village is not predictable from the median arsenic well test, adjusting only for age and gender
- Adding a comparison population is not the solution

Morales et al., 2000

- Their plots indicate data points are too disperse for reliable prediction.
- Morales et al. pointed out that the assumption that all persons within a village had the same exposure may not be the case.

Well tests in Taiwan data

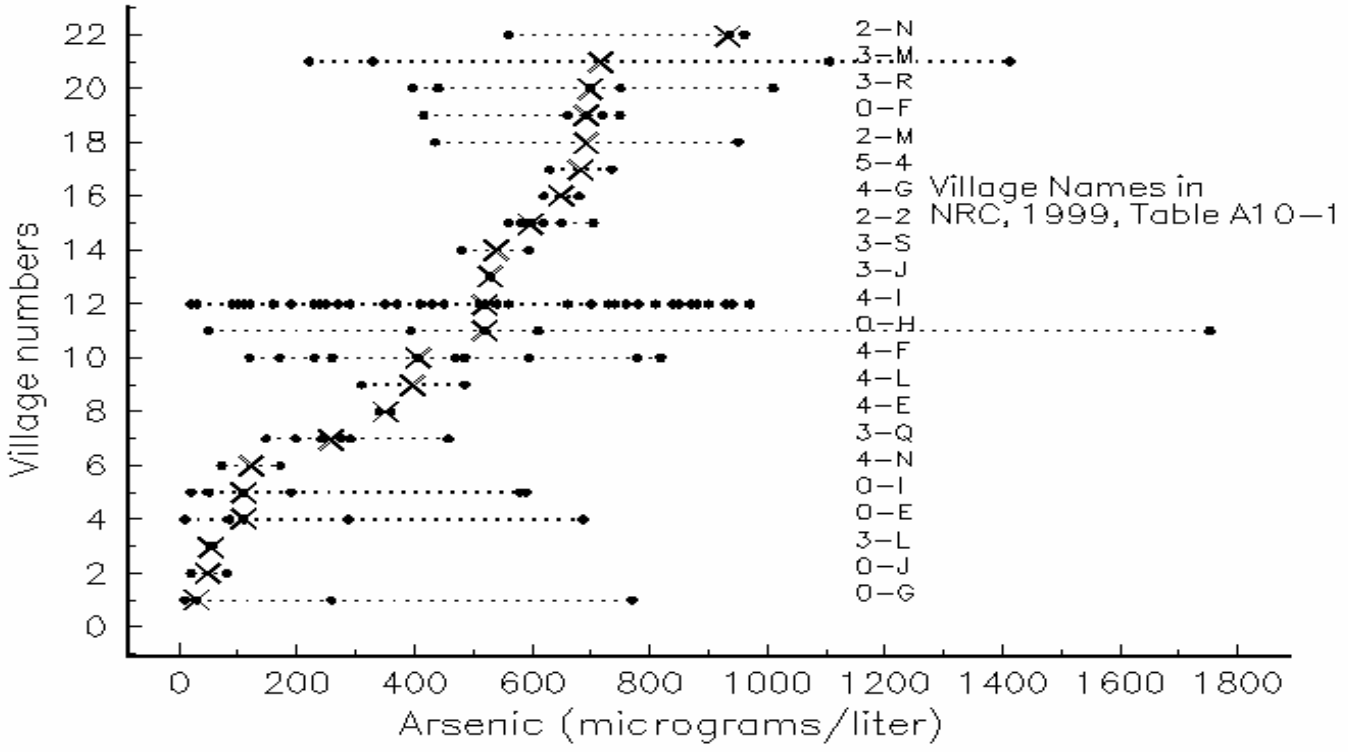
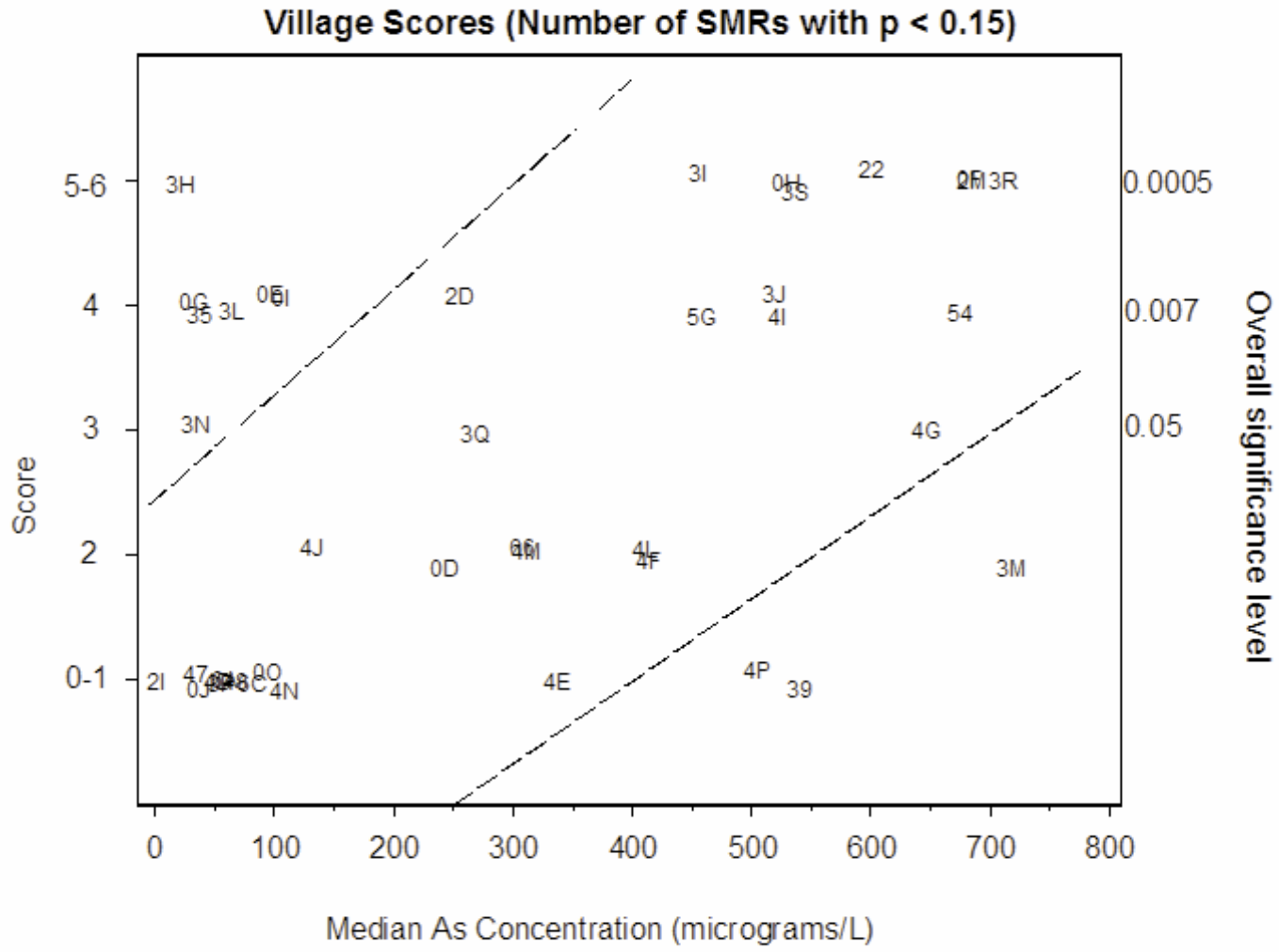


Figure 3.


Village Scores (Number of SMRs with p < 0.15)
Score
5-6
4
3
2
0-1
0.0005
0.007
0.05
Overall significance level
0
100
200
300
400
500
600
700
800
Median As Concentration (micrograms/L)
3H
3I
22
3R
3S
0G
3L
2D
3J
5G
4I
54
3N
3Q
4G
4J
0D
3M
2I
4E
4P
39
4N

Score Conclusion

- One cannot expect to predict excess cancer mortality from village dose, even from villages with a single well.
- The lack of fit from the parametric models of Morales et al. (2000) is not surprising.

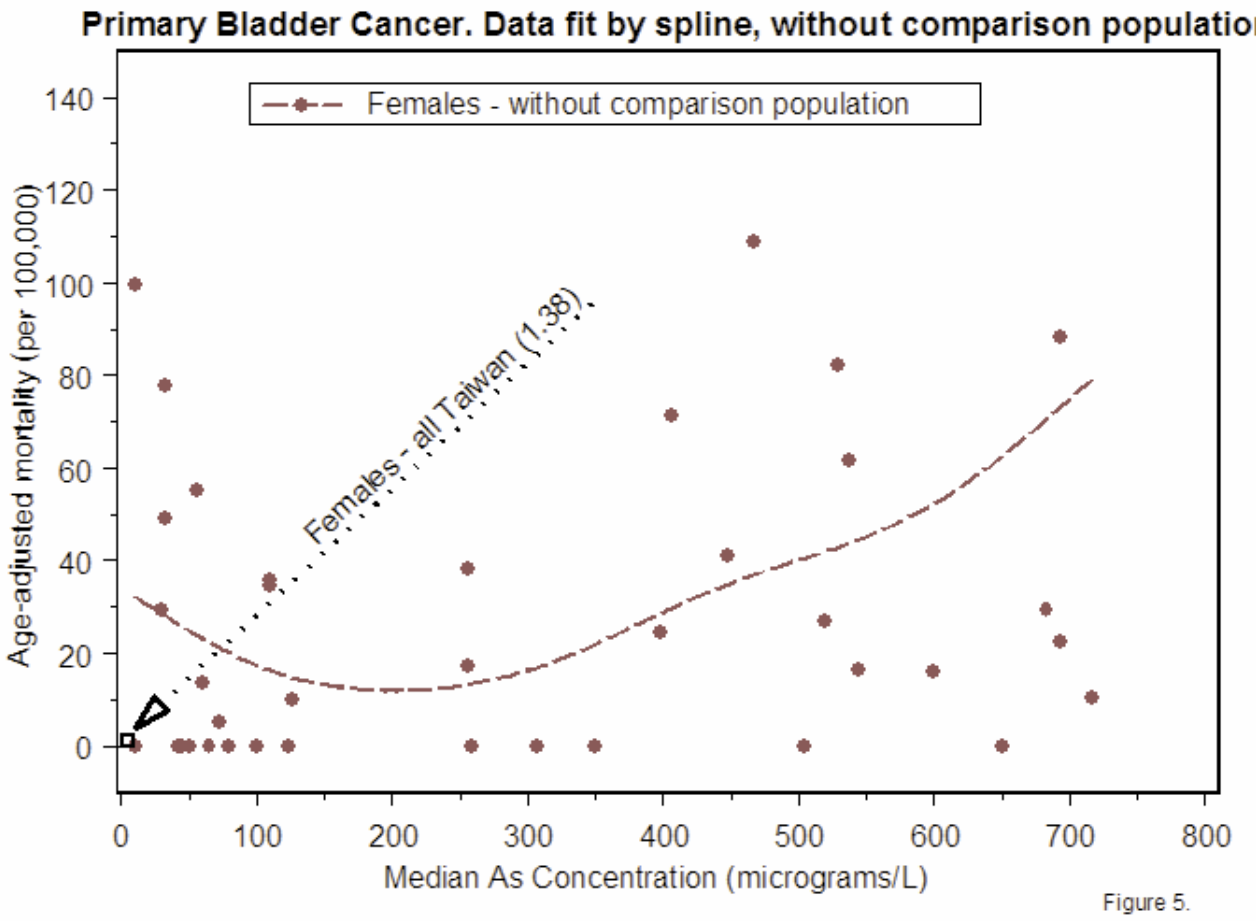

Primary Bladder Cancer. Data fit by spline, without comparison population.
Females - without comparison population
Females - all Taiwan (1,38)
Age-adjusted mortality (per 100,000)
0
20
40
60
80
100
120
140
0
100
200
300
400
500
600
700
800
Median As Concentration (micrograms/L)

Figure 5.

Bladder Cancer Conclusion

- If the bladder cancer data are used for dose-response, the data are most consistent with a high background rate and risk estimates at low dose that are likely too high (biased upward).

Primary Bladder Cancer. Data fit by spline, with and without comparison population of all Taiwan.

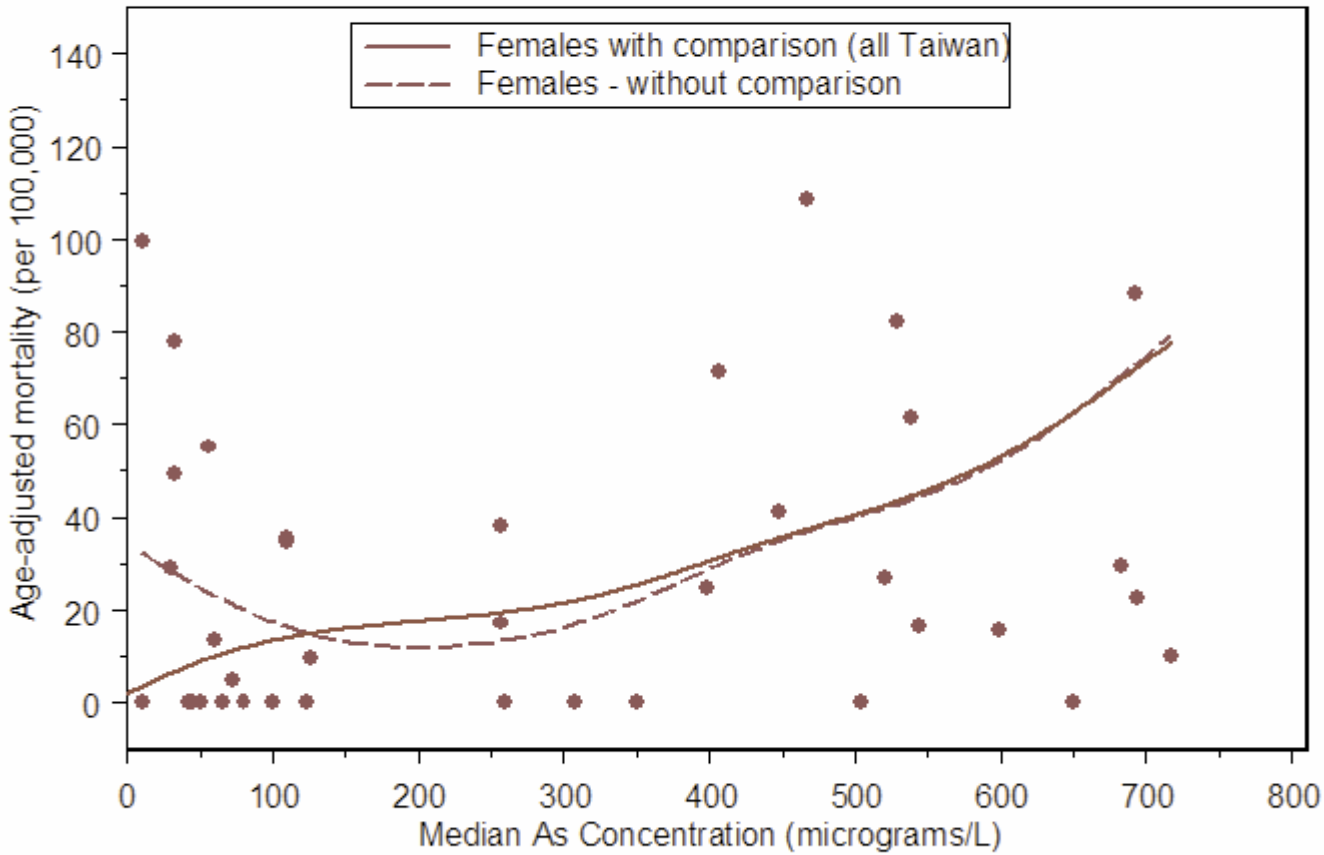


Figure 7.

Comparison Population Conclusion

- If the bladder cancer data are used for dose-response and force fit with a comparison population as shown, then the slope factor is likely too high (biased upwards).

Summary Conclusions

- S.W. Taiwan data really are insufficient for dose-response analysis.
- Using a comparison population is not a solution and, in fact, likely produces substantial upward bias in the slope factor.
- EPA estimates of cancer risk at low levels of arsenic in the U.S., using the modeling of S.W. Taiwan data as the basis, are highly questionable and likely biased upwards.